

of this technique. In the hearings of the Senate Subcommittee on Air and Water Pollution on missile and rocket propellants a number of details relating to the Titan II system were described. The following overview of the actual measures undertaken as part of this system engineering effort will be more useful when the schematic illustrations in Figures 1 and 2 are reviewed.

During the conceptual phases of this system, authorities concerned with the operational program, in accordance with departmental regulations, presented information to the military medical services regarding the fuels proposed with a request that information be provided regarding possible effects on operator personnel and also any other harmful characteristics which should be considered. A review was made of the available toxicological and environmental health data in the light of the proposed deployment of the system. An analysis was made of the problems of production, installation and checkout and attendant maintenance problems. Based upon these tentative evaluations there were incorporated into the "system development plan" requirements for research on toxicology, on environmental detection devices, on environmental controls, and on occupational and environmental medical needs.

Since the initial information indicated that there was a substantial body of knowledge regarding one of the propellants, nitrogen tetroxide, but relatively less regarding the other, unsymmetrical dimethyl hydrazine, preliminary precautionary plans were developed. These pertained to work conducted in the contractor's facilities and those on defense bases. Interim technical orders and precautionary instructions were issued. The hazards research, including that relating to both air and water pollution, was implemented. Based on initial results, some modification of the initial precautionary procedures was possible.

Since the possibility of catastrophic accident at an operational facility had to be taken into account and a need for providing for potential pollution control, these elements were included in the site surveys to determine where the facilities should be located. Assumptions had to be made as to the degree of effectiveness which could be provided in the pollution control system. It should be noted that

ENVIRONMENTAL HEALTH & BIOMEDICAL ENGINEERING TYPICAL SYSTEMS PROGRAM CONSIDERATIONS

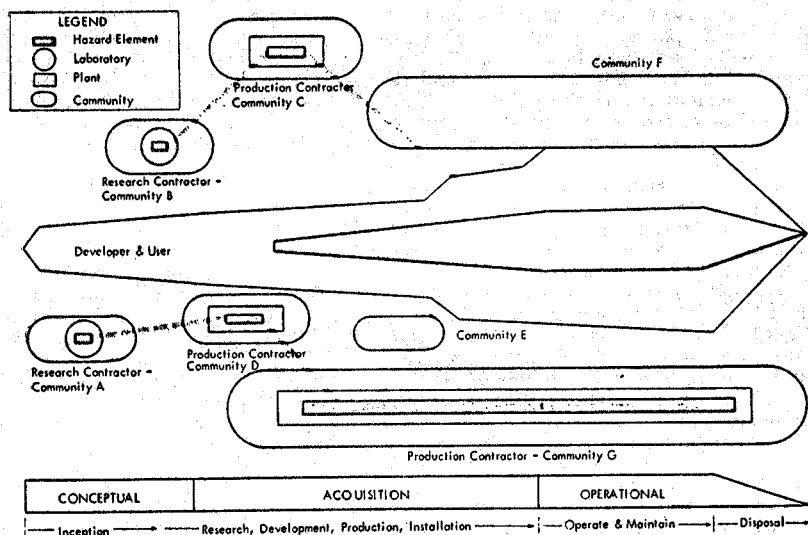


FIGURE 1. Environmental health and biomedical engineering; typical systems program considerations. In systems programs there are generally three time phases: (1) conceptual, (2) acquisition, and (3) operational. The effect of potential hazards must be considered as the summation of effects of the researcher, the builder, the production worker, and the user. Concurrently, consideration must be given to effect on the health of the community adjacent to the plant or site, or through which materials and components must be transported.